

REMARKS

By this Amendment, Claim 9 has been canceled, Claims 8, 10, 11, 13-15 and 24-29 have been amended, and Claim 33 has been added, leaving Claims 8, 10-18 and 24-33 pending in the application. Reconsideration of the Official Action is respectfully requested in view of the following remarks.

Allowable Subject Matter

Applicants gratefully acknowledge the indication in the Official Action that Claims 25 and 29 contain allowable subject matter. Claims 25 and 29 have been rewritten in independent form to include the combinations of features of Claims 25, 9 and 8, and Claims 29 and 13, respectively, and thus are allowable. As suggested in the Advisory Action, Claim 25 has been amended to recite the features of “the component is a component other than a chamber liner.”

Rejection Under 35 U.S.C. § 112

Claims 8-12, 14, 15, 17, 18 and 24-28 stand rejected under 35 U.S.C. § 112, first paragraph. The reasons for the rejection are stated on pages 2-3 of the Official Action.

Claim 9 has been cancelled. Claim 8 has been amended to delete the term “and/or”. Claims 14 and 24 have been amended to change the term “and/or” to “or.”

Withdrawal of the rejection is respectfully requested.

Rejection Under 35 U.S.C. § 102

Claims 8-12, 14-15, 18 stand rejected under 35 U.S.C. § 102(e) over WO 99/63584 to Nakagawa et al. ("Nakagawa"). The rejection is respectfully traversed.

Claim 8 has been amended to include the features of Claim 9. Claim 8, as amended, recites "a component of semiconductor processing equipment, the component comprising a substrate having a surface and a liquid crystalline polymer coating on the surface of the substrate and forming an outer surface of the component, the outer surface being resistant to plasma erosion and corrosion in the semiconductor processing equipment, wherein the component is a component other than a chamber liner" (emphasis added). Nakagawa fails to disclose the combination of features recited in Claim 8.

Nakagawa discloses a chamber liner that is made of aluminum. See, e.g., page 4, lines 25-27 of Nakagawa. Nakagawa does not disclose any component that comprises a substrate having a surface, and a liquid crystalline polymer coating on the surface and forming an outer surface of the component, much less a component other than a chamber liner, as recited in Claim 8. In contrast, Nakagawa discloses a resin molded article for use in the liner (see page, line 25). The resin molded article is made of a resin powder, which can include one or more of the resin powders disclosed at page 5, lines 24-30 of Nakagawa. Nakagawa discloses that polyimide resin powder is preferred for making the resin molded article (page 6, lines 15-19). Liquid crystal polymer is one of the materials mentioned by Nakagawa for making the resin molded article.

As explained at page 4, lines 19-20 of Nakagawa, "it is critical that the resin molded article be a seamless annular molded article" (emphasis added). Nakagawa

fails to disclose that the resin molded article, which must be a seamless annular molded article, can be used for any component other than a chamber liner. Rather, Nakagawa discloses that the resin molded article must have a seamless annular configuration for its specific use with the chamber liner.

The Official Action asserts that "Nakagawa discloses the liquid crystal polymer was coated on the surface of the aluminum surface substrate (page 7)" (emphasis added). However, Nakagawa does not provide this alleged disclosure. Nakagawa discloses Comparative Example 1 at page 7, lines 12-19. In Comparative Example 1, a polyimide precursor dispersion was applied with a spray gun onto an alumite-treated aluminum chamber liner. Nakagawa clearly discloses that a "polyimide" is a different material than a "liquid crystal polymer." See page 5, line 24 of Nakagawa. Nakagawa does not disclose applying a liquid crystal polymer on the chamber liner.

By definition, Nakagawa's resin molded article of the liquid crystal polymer must be made by molding. As explained at page 6, lines 13-14 of Nakagawa, "[t]hese resin molded articles can be produced by a known molding method suitable for the particular resin powder used" (emphasis added). Nakagawa does not disclose that the liquid crystal polymer can be applied on a surface of a substrate by a coating method, much less on a component that is not a chamber liner.

For at least the foregoing reasons, the component recited in Claim 8 is patentable over Nakagawa.

Claims 10-12, 14, 15 and 18 depend from Claim 8 and thus are also patentable over Nakagawa for at least the same reasons as those discussed with respect to Claim 8. Moreover, these dependent claims recite additional features that further patentably distinguish the claimed component over Nakagawa. For example,

Claim 14 recites that “the component is a plasma chamber wall, a gas distribution plate, a gas ring, a pedestal, an electrostatic chuck or a focus ring.” The Official Action asserts that “Nakagawa discloses the component is a chamber wall and the liquid crystal polymer comprises a preformed sheet covering the surface of a substrate (abstract).” As explained above, however, the only type of component that Nakagawa discloses the resin molded article can be provided on is a chamber liner.

Claim 15 recites that “the liquid crystalline polymer comprises a preformed sheet covering a surface of a substrate.” In other words, the sheet is preformed and applied to cover a surface of a substrate. Nakagawa’s resin molded article is not a sheet, much less a preformed sheet. In contrast, Nakagawa’s resin molded article is formed by molding into its required seamless annular configuration, which is different from a “sheet,” as recited in Claim 15.

Therefore, withdrawal of the rejection is respectfully requested.

First Rejection Under 35 U.S.C. § 103

Claims 13, 24, 27 and 31 stand rejected under 35 U.S.C. § 103(a) over Nakagawa in view of U.S. Patent No. 6,120,854 to Clarke et al. (“Clarke”). The rejection is respectfully traversed.

Independent Claim 13, as amended, recites the features of “a component of semiconductor processing equipment, the component comprising a substrate including a surface and a plasma-sprayed liquid crystalline polymer coating on the surface of the substrate and forming an outer surface of the component, the outer surface being resistant to plasma erosion and corrosion in the semiconductor processing equipment” (emphasis added). It is acknowledged in the Official Action

that Nakagawa fails to disclose a liquid crystalline polymer that is a plasma sprayed coating, as recited in Claim 13. However, it is asserted in the Official Action that Nakagawa discloses that the liquid crystalline polymer was applied with a spray gun, citing to column 4, lines 60-63 of Nakagawa.

It is further asserted in the Official Action that Clarke discloses liquid crystalline polymers comprising a plasma sprayed coating and that it would have been obvious to use a plasma sprayed coating to form liquid crystalline polymer. Applicants respectfully disagree with these assertions.

Nakagawa does not disclose applying a liquid crystalline polymer with a spray gun, as asserted in the Official Action. In contrast, in Comparative Example 1 of Nakagawa, a polyimide precursor dispersion, not a liquid crystalline polymer, was applied to an alumite-treated aluminum chamber liner using a spray gun. Nakagawa does not suggest applying a liquid crystalline polymer as a coating on a surface of a substrate, much less as a plasma-sprayed coating.

Accordingly, Nakagawa does not suggest a component of semiconductor processing equipment comprising "a substrate including a surface and a plasma-sprayed liquid crystalline polymer coating on the surface" (emphasis added), as recited in Claim 13.

Moreover, for the reasons stated at page 10, first full paragraph of the Amendment filed on June 22, 2004, Nakagawa teaches away from forming resin-coated articles for a plasma etching chamber.

Clarke discloses plasma spraying of particulate thermotropic liquid crystalline polymers onto surfaces of composite and metallic structures, such as a ship or on a

military or commercial aircraft (column 1, lines 54-63). Applicants submit that Clarke is non-analogous prior art with respect to the claimed subject matter.

Particularly, in order to be able to rely on a reference as a basis for rejection of claimed subject matter, "the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." See, e.g., In re Oetiker, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also, MPEP § 2141.01(a).

However, Clarke is first not directed to the field of semiconductor processing equipment. Second, Clarke is not reasonably pertinent to the problem to which the claimed component is directed to; namely, to providing a plasma erosion resistant and corrosion resistant surface on components of plasma processing equipment. The claimed surface can reduce particle and metallic contamination of semiconductor wafers processed in the equipment. Accordingly, Clarke is non-analogous prior art with respect to the claimed subject matter.

However, the Official Action asserts that Applicants' argument presented in the June 22, 2004 Amendment that Clarke is not reasonably pertinent to the problem of "providing plasma resistant and corrosion resistant surfaces on components of plasma processing equipment to reduce particle and metallic contamination of semiconductor wafers processed in the equipment," is not commensurate in scope with that of the claim because "[t]here is no limitation in the claim that requires that the articles must provide 'plasma resistant and ... reduce particle and metallic contamination of semiconductor wafers.'" See page 9, first full paragraph of the Official Action. Although the Official Action has cited to no legal authority to support

this assertion¹, to expedite prosecution, Claim 13 has been amended to recite the features of “the outer surface [of the plasma-sprayed liquid crystalline polymer coating on the surface] being resistant to plasma erosion and corrosion in the semiconductor processing equipment.”

Moreover, the Official Action has failed to establish the required motivation to modify Nakagawa's chamber liner by applying the resin material by plasma spraying to produce the claimed component. Nakagawa teaches that resin-coated chamber liners have inferior durability as compared to chamber liners including a resin molded article when used in a plasma etching chamber (see the paragraph bridging pages 7-8). As such, Nakagawa teaches directly away from using resin-coated chamber liners in semiconductor processing equipment.

For the foregoing reasons, Applicants submit that the component recited in Claim 13 is patentable.

Claim 24 recites that “the component is a plasma chamber wall, a chamber liner, a gas distribution plate, a gas ring, a pedestal, an electrostatic chuck or a focus ring.” The combination of Nakagawa and Clarke also fails to suggest the combination of features of Claim 24.

¹ In fact, Pentec, Inc. v. Graphic Controls Corp., 227 USPQ 766 (Fed. Cir. 1985), provides legal precedent that refutes this assertion. In Pentec, the court stated that “[t]he problem confronting Hubbard was the need for a simple holding means to enable frequent, secure attachment and easy removal of a marked pen to and from a pen arm.” Id. at 769. Although these problems addressed by the “holding means” were not expressly recited in the claim at issue in Pentec, the court concluded that one of ordinary skill in the art trying to solve the same problem as that addressed by the claimed subject matter would not have looked to the applied prior art, i.e., that the prior art was non-analogous. Id.

Dependent Claims 27 and 31 are also patentable for at least the same reasons as those stated for Claim 13.

Therefore, withdrawal of the rejection is respectfully requested.

Second Rejection Under 35 U.S.C. § 103

Claim 16 stands rejected under 35 U.S.C. § 103(a) over Nakagawa in view of Clarke, and further in view of U.S. Patent No. 6,468,665 to Nagashima et al. ("Nagashima"). The rejection is respectfully traversed.

Claim 16 depends from Claim 13 and recites additional features that further patentably distinguish the claimed component over Nakagawa and Clarke. Particularly, Claim 16 recites that "the component comprises a roughened surface that has been subjected to a surface roughening treatment and which is in contact with the plasma sprayed coating applied on the roughened surface" (emphasis added).

As acknowledged in the Official Action, neither Nakagawa nor Clarke discloses or suggests the combination of features recited in Claim 16. However, the Official Action asserts that Nagashima cures the deficiencies of Nakagawa and Clarke.

As explained above, however, Clarke is non-analogous prior art with respect to Claim 13. Accordingly, the rejection is improper for this reason.

Nagashima also is non-analogous prior art. Nagashima discloses molded articles including a liquid crystalline polyester melt-bonded to a metal. Nagashima does not suggest that the molded articles are for plasma processing equipment.

Accordingly, Nagashima is not directed to the field of semiconductor processing equipment. Nagashima also is not reasonably pertinent to the above-discussed problem addressed by the claimed component. Accordingly, the rejection is improper for this additional reason.

Moreover, Nagashima fails to provide the required motivation to modify Nakagawa to result in a component having the combination of features recited in Claim 16. Nagashima is directed to a process for melt-bonding a molded article of liquid crystalline polyester with metal. Nagashima discloses "a thermotropic liquid crystalline polyester resin of which the surface is subjected to roughening treatment" (column 11, lines 47-49). That is, Nagashima roughens the surface of the liquid crystalline polyester. However, Claim 16 recites that "the component comprises a roughened surface ... which is in contact with the plasma sprayed coating applied on the roughened surface." That is, the plasma sprayed coating is applied on the roughened surface. Accordingly, Nagashima also does not cure the deficiencies of Nakagawa regarding the component recited in Claim 16.

Therefore, withdrawal of the rejection of Claim 16 is respectfully requested.

Third Rejection Under 35 U.S.C. § 103

Claim 17 stands rejected under 35 U.S.C. § 103(a) over Nakagawa in view of U.S. Patent No. 6,048,919 to McCullough ("McCullough"). The reasons for the rejection are stated on page 6 of the Official Action. The rejection is respectfully traversed.

Claim 17 depends from Claim 8. The Official Action asserts that McCullough discloses a moldable composition including a liquid crystal polymer and a thermally

conductive filler. McCullough discloses that the composition is for heat sink devices (column 6, lines 35-38).

As discussed above regarding Clarke, the Official Action states the same position with respect to McCullough concerning Applicants' position that McCullough is not reasonably pertinent to the problem addressed by the claimed component.

For the reasons stated above, however, this position is also improper with respect to McCullough, and McCullough does not qualify as analogous prior art with respect to the subject matter recited in Claim 17 because McCullough is neither directed to the field of semiconductor processing equipment, nor reasonably pertinent to the above-discussed problem addressed by the claimed component, as recited in Claim 8.

Moreover, McCullough does not suggest modifying Nakagawa to result in the component of semiconductor processing equipment recited in Claim 8.

Accordingly, the component recited in Claim 17 is also patentable over the applied references for at least the same reasons as those stated regarding Claim 8.

Therefore, withdrawal of the rejection of Claim 17 is respectfully requested.

Fourth Rejection Under 35 U.S.C. § 103

Claim 26 stands rejected under 35 U.S.C. § 103(a) over Nakagawa in view of Nagashima. The rejection is respectfully traversed.

Claim 26 depends from Claim 8 and recites that the component further comprises "at least one intermediate layer between the surface of the substrate and the coating." The Official Action admits that Nakagawa fails to disclose the features

recited in Claim 26. However, the Official Action asserts that Nagashima cures Nakagawa's deficiencies. Applicants respectfully disagree with these assertions.

As explained above, Nakagawa teaches away from forming a coating of a liquid crystalline polymer, much less on a component of semiconductor processing chamber other than a chamber liner, as recited in Claim 8. Nakagawa discloses that coatings do not provide suitable properties as compared to the resin molded articles for chamber liners.

Nagashima is non-analogous prior art.

Accordingly, Claim 26 also is patentable.

Therefore, withdrawal of the rejection of Claim 26 is respectfully requested.

Fifth Rejection Under 35 U.S.C. § 103

Claim 30 stands rejected under 35 U.S.C. § 103(a) over Nakagawa and Clarke in view of Nagashima. The rejection is respectfully traversed.

Claim 30 depends from Claim 13. As explained above, Clarke and Nagashima both are not prior art references with respect to Claim 30.

Moreover, Clarke and Nagashima do not suggest modifying Nakagawa's resin molded articles for chamber liners to result in the combination of features recited in Claim 13. Thus, Claim 30 also is patentable over the applied references for at least the same reasons as those stated with respect to Claim 13.

Therefore, withdrawal of the rejection of Claim 30 is respectfully requested.

Sixth Rejection Under 35 U.S.C. § 103

Claim 28 stands rejected under 35 U.S.C. § 103(a) over Nakagawa in view of U.S. Patent No. 6,508,911 to Han et al. ("Han"). The rejection is respectfully traversed.

Claim 28 depends from Claim 8. The Official Action acknowledges that Nakagawa fails to suggest the combination of features recited in Claim 28, but asserts that Han cures these deficiencies. Applicants respectfully disagree.

Han discloses diamond coated parts in a plasma reactor. However, Han fails to provide any motivation to modify Nakagawa to result in the combination of features recited in Claim 8. Accordingly, Claim 28 also is patentable for at least the same reasons as those stated with respect to Claim 8.

Therefore, withdrawal of the rejection of Claim 28 is respectfully requested.

Seventh Rejection Under 35 U.S.C. § 103

Claim 32 stands rejected under 35 U.S.C. § 103(a) over Nakagawa and Clarke, and further in view of Han. The rejection is respectfully traversed.

Claim 32 depends from Claim 13. The Official Action admits that Nakagawa and Clarke fail to suggest the combination of features recited in Claim 32, but asserts that Han cures these deficiencies. Applicants respectfully disagree.

For reasons stated above, Clarke does not qualify as a prior art reference with respect to Claim 32.

Moreover, Han fails to provide the required motivation to modify Nakagawa to result in the combination of features recited in Claim 13, including the features of "the

component comprising a substrate including a surface and a plasma-sprayed liquid crystalline polymer coating on the surface." Han does not disclose liquid crystalline polymer coatings, much less plasma-sprayed liquid crystalline polymer coatings. Accordingly, Claim 32 is also patentable for at least the same reasons as those stated with respect to Claim 13.

Therefore, withdrawal of the rejection of Claim 32 is respectfully requested.

New Claim

Claim 33 is also patentable.

Conclusion

For the foregoing reasons, allowance of the application is respectfully requested. Should the Examiner have any questions concerning this response, Applicants' undersigned representative can be reached at the telephone number given below.

Respectfully submitted,

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